

WHAT IS CLAIMED IS:

1. A nucleic acid sequence encoding an early liver developmental protein selected from the group consisting of genes 20, 36, 41, 112, 114, 118, and 129, and genes coding for elf proteins 1-3, liyor-1 (145), pk, protein 106 and praja-1.

2. A nucleic acid sequence according to claim 1 wherein the nucleic acid is selected from the group consisting of the sequence as depicted in Figs. 1A-1B, Figs. 2A-2J, Figs 3A-3B, Figs 4A-4B, and Fig. 5.

3. An isolated early liver developmental protein selected from the group consisting of elf, liyor-1 (145), pk, protein 106, and praja-1. 2

4. An isolated early liver developmental protein according to claim 3 wherein the protein is an elf protein.

5. An isolated early liver developmental protein according to claim 3 wherein the protein is a mouse elf protein.

6. An isolated early liver developmental protein having a sequence encoded by the nucleic acid sequence of claim 2.

7. A method of treating a liver disorder selected from the group consisting of cholestasis, biliary stones, liver obstruction, stricture, primary biliary cirrhosis and primary sclerosing cholangitis comprising administering an effective amount of the protein according to claim 4 to a patient having one of these conditions.

8. A method of treating a disease selected from the group of end stage liver disease, hepatocellular carcinoma, anhidrotic ectoderm dysplasia, degenerative neurological disorders, anemia, ataxia, hemochromatosis, sideroblastic anemia, and spinocerebellar ataxia comprising administering an effective amount of the protein according to claim 3 to a patient having one of these conditions.

9. A method for detecting colon cancer comprising the steps of taking a colon cell from a patient, testing for the presence of praja-1 in the cell, and then determining whether the cells are cancerous based on the detection of praja-1 in 2

the tested cell.

10. A method of isolating genes coding for early developing liver proteins comprising the steps of constructing cDNA libraries at stages in the range of e9 through e14.5 following coitus in a developing mouse and isolating cDNA coding for liver proteins that are expressed during at least one of these stages.

11. A method according to claim 10 wherein the stages where the cDNA libraries are constructed comprise (1) around days e9-e10 post coitus, (2) around days e10.5-e11 post coitus, (3) around days e11.5-e12 post coitus, and (4) around days e13-e14.5 post coitus.

12. A method according to claim 10 wherein the isolated cDNA codes for stage-specific early-developing liver proteins.

13. An isolated gene coding for an early developing liver protein produced by the method of claim 12.

14. An isolated early developing liver protein produced by expression of an isolated gene according to claim 13.

15. An antibody recognizing a protein according to claim 3.

16. An antibody recognizing a protein according to claim 4.

17. An antibody recognizing a peptide selected from the group consisting of the peptide at aa 2-14 of mouse elf gene N-terminus having the sequence 5-ELQRTSSVSGPLS-3, the peptide at aa 2140-2154 of mouse elf gene C-terminus having the sequence 5-FNSRRTASDHSWSG-3, the peptide at aa 144-156 of mouse prajal gene middle portion having the sequence 5-LRRKYRSREQPQS-3, the 145peptide-A from the C-terminus of gene 145 (Cded) having the sequence 5-SAQSLVVTLGRVEGGIRV-3 OR 5-CSAQSLVVTLGRVEGGIRV-3, the 145peptide-B from the middle part of gene 145 (Cded) having the sequence 5-KIEGSSKCAPLRPASRL-3 or 5-CAPLRPASRLPASQTLG-3, the g59peptide-A from the N-terminus of gene G59 (Prajal) having the sequence 5-PPREYRASGSRRGMAY-3 or 5-PPREYRASGSRRGMAYC-3, the g59peptide-B (15-mer) from the middle part of gene 59 (Prajal) having the sequence 5-CKVPRRRRTMADPDEW-3, and the fusion

protein covering the two EF-hands motifs of itih-4.

18. An antibody according to claim 17 wherein the antigen is selected from the group consisting of peptide sequences LRRKYRSREQPOS (SEQ ID NO:21), SAQSLVVTLGRVEGGIRV (SEQ ID NO:22), CSAQSLVVTLGRVEGGIRV (SEQ ID NO:23), KIEGSSKCAPLRPASRL (SEQ ID NO:24), CAPLRPASRLPASQTLG (SEQ ID NO:25), PPREYRASGSRRGMAY (SEQ ID NO:26), PPREYRASGSRRGMAYC (SEQ ID NO:27), and CKVPRRRRTMADPDFW (SEQ ID NO:28).

19. An antibody recognizing the elf protein.

20. An antibody according to claim 20 wherein the elf protein is the mouse elf protein.